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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dallas J. Bergh et al.	§	Group Art Unit: 2836
Serial No.: 09/967,177	§	Examiner: Nguyen, Danny
Filed: September 28, 2001	§	
For: RELAY SOCKET WITH LEAKAGE CURRENT SUPPRESSION	§	Atty. Docket: ALBR:0099/YOD/EUB 01AB099

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37 C.F.R. 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date below:

September 21, 2006 — Melissa Neumann
Date — Melissa Neumann

APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal mailed on June 22, 2006, and received by the Patent Office on June 26, 2006. The Notice of Appeal was filed concurrently with a Pre-Appeal Brief Request for Review. A Notice of Panel Decision from Pre-Appeal Brief Review was mailed on August 21, 2006, and required the filing of the present Appeal Brief. The Notice also reset the time period for filing of the present Appeal Brief to one month following the mailing date of the Notice, i.e. September 21, 2006. As a result, this Appeal Brief is believed to be timely filed.

The Commissioner is authorized to charge the requisite fee of $500.00 for this Appeal Brief, and any additional fees which may be necessary to advance prosecution of the present application, to Deposit Account No. 01-0857, Order No. 01AB099/YOD/EUB (ALBR:0099). Further, in accordance with 37 C.F.R. § 1.136, Appellants hereby provide a general authorization to treat this and any future reply requiring an extension of time as incorporating a request therefor. Furthermore,

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Appellants authorize the Commissioner to charge the appropriate fee for any extension of time to Deposit Account No. 01-0857, Order No. 01AB099/YOD/EUB (ALBR:0099).

1. REAL PARTY IN INTEREST

The real party in interest is Rockwell Automation Technologies, Inc., the Assignee of the above-referenced application by virtue of the Assignment recorded at reel 012640, frame 0466, and recorded on March 11, 2002. Rockwell Automation Technologies, Inc., the Assignee of the above-referenced application as evidenced by the documents mentioned above, will be directly affected by the Board's decision in the pending appeal.

2. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any other appeals or interferences related to this appeal. The undersigned is Appellants' legal representative in this appeal.

3. STATUS OF CLAIMS

Claims 1-38 are currently pending, are currently under final rejection, and, thus, are the subject of this appeal.

4. STATUS OF AMENDMENTS

As the instant claims have not been amended subsequent to the Final Office Action mailed March 22, 2006, there are no outstanding amendments to be considered by the Board.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates generally to the field of electrical circuit control. *See* Application, page 1, lines 5-6. More specifically, the present invention relates to a novel technique for avoiding the accidental tripping of switching devices, such as relays, caused by inadvertent current leaking into a control circuit of the device. *Id.* at page 1, lines 6-8; page 2, lines 24-27; page 6, line 24 – page 7, line 6. Among other things, this

technique addresses a need in the art for a system capable of tripping the switching device in response to a control signal if the magnitude of the current of the control signal is above a certain input threshold, while avoiding tripping of the device if the control signal input is below the input threshold, such as current that may leak into the circuit unintentionally. *See id.* The present application contains five independent claims, namely claims 1, 11, 19, 29, and 34, all of which have been improperly rejected and, thus, subject to this appeal. The subject matter of these claims is summarized below.

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a control circuit (e.g., 48) for an electrical relay (e.g., 10). *See, e.g., id.* at page 3, lines 25-28; page 6, line 4 – page 7, line 6; FIG. 3. The circuit includes a solid state switch (e.g., 62) configured to be coupled to a relay operator (e.g., 66) to control energization of the relay operator, and a leakage current suppression circuit (e.g., 60) configured to be coupled electrically in parallel with the solid state switch to conduct leakage current leaking *into* the control circuit. *See, e.g., id.* at page 6, lines 24-28; page 8, lines 1-16; FIGS. 4-5. The leakage current suppression circuit is also configured to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an *input* leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the control signal level is below the *input* leakage current threshold. *See, e.g., id.* at page 5, lines 12-14; page 7, lines 1-6; page 8, lines 1-9; page 9, lines 1-12.

With respect to the aspect of the invention set forth in independent claim 11, discussions of the recited features of claim 11 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a control circuit (e.g., 48) for an electrical relay (e.g., 10). *See, e.g., id.* at page 3, lines 25-28; page 6, line 4 – page 7, line 6; FIG. 3. The circuit includes a rectifier circuit (e.g., 54) for receiving AC or DC control signals and

for outputting DC control signals, a DC bus (e.g., 58) coupled to the rectifier circuit for receiving the DC control signals, and a control signal conditioning circuit (e.g., 56) coupled to the DC bus for conditioning the DC control signals. *See, e.g., id.* at page 6, lines 11-20; page 7, lines 14-27; FIGS. 3-5. The circuit also includes a solid state switch (e.g., 62) configured to be coupled across the DC bus in series with a relay operator (e.g., 66) to control energization of the relay operator, and a leakage current suppression circuit (e.g., 60) configured to be coupled across the DC bus electrically in parallel with the solid state switch to conduct leakage current leaking *into* the control circuit. *See, e.g., id.* at page 6, lines 24-28; page 8, lines 1-16; FIGS. 4-5. The leakage current suppression circuit is further configured to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an input leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the control signal level is below the input leakage current threshold. *See, e.g., id.* at page 5, lines 12-14; page 7, lines 1-6; page 8, lines 1-9; page 9, lines 1-12.

Regarding the aspect of the invention set forth in independent claim 19, discussions of the recited features of claim 19 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a relay control circuit (e.g., 48). *See, e.g., id.* at page 6, line 4 – page 7, line 6; FIG. 3. The relay control circuit includes a relay (e.g., 10) having an operator (e.g., 66) and at least two output lines (e.g., 34, 36, 38). *See, e.g., id.* at page 3, lines 25-28; page 4, lines 22-28; page 6, lines 27-28. The control circuit also includes a solid state switch (e.g., 62) coupled in series with the relay operator (e.g., 66) to control energization of the relay operator, and a leakage current suppression circuit (e.g., 60) coupled electrically in parallel with the solid state switch. *See, e.g., id.* at page 6, lines 24-28; page 8, lines 1-16; FIGS. 4-5. Additionally, the leakage current suppression circuit is operative to conduct leakage current leaking into the control circuit and to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an input leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the

control signal level is below the input leakage current threshold. *See, e.g., id.* at page 5, lines 12-14; page 7, lines 1-6; page 8, lines 1-9; page 9, lines 1-12.

Further, with regard to the aspect of the invention set forth in independent claim 29, discussions of the recited features of claim 29 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a terminal block relay assembly having a terminal block (e.g., 12) including input terminals (e.g., 24, 26), output terminals (e.g., 34, 36, 38), a bay (e.g., 18) for receiving a relay, and connections (e.g., 30) for routing signals between the terminals and the relay. *See, e.g., id.* at page 3, line 25 – page 4, line 28; FIG. 1. The assembly also includes a relay (e.g., 10) disposed in the bay and coupled to the connections, the relay having an operator (e.g., 66), and a circuit board (e.g., 14) supported in the terminal block and coupled to the input terminals and to the relay operator via two of the connections. *See, e.g., id.* at page 3, line 25 – page 4, line 4; page 6, lines 27-28; FIGS. 1-3. Additionally, the assembly includes a solid state switch (e.g., 62) supported on the circuit board and coupled in series with the relay operator to control energization of the relay operator, and a leakage current suppression circuit (e.g., 60) supported on the circuit board and coupled electrically in parallel with the solid state switch. *See, e.g., id.* at page 6, lines 24-28; page 8, lines 1-16; FIGS. 4-5. The leakage current suppression circuit is operative to conduct leakage current leaking into the terminal block relay assembly and to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an input leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the control signal level is below the input leakage current threshold. *See, e.g., id.* at page 5, lines 12-14; page 7, lines 1-6; page 8, lines 1-9; page 9, lines 1-12.

Finally, regarding the aspect of the invention set forth in independent claim 34, discussions of the recited features of claim 34 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in

accordance with the present invention relates to a method for controlling a relay circuit (e.g., 48). *See, e.g., id.* at page 6, line 4 – page 7, line 6; FIG. 3. The method includes controlling a conductive state of a solid state switch (e.g., 62) in series with a relay coil (e.g., 66) such that the relay coil is energized if a current level of an input control signal is above a predetermined input leakage current threshold level and is deenergized if the current level of the input control signal is below the predetermined input leakage current threshold level. *See, e.g., id.* at page 5, lines 12-14; page 6, line 24 – page 7, line 6; page 8, lines 1-16; page 9, lines 1-12.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's first ground of rejection in which the Examiner rejected claims 1-28 and 34-38 under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,159,501 to White ("the White reference") in view of U.S. Patent No. 6,522,033 to Nevo ("the Nevo reference").

Second Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's second ground of rejection in which the Examiner rejected claims 29-33 under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,864,455 to Gernhardt et al. ("the Gernhardt et al. reference") in view of the White and Nevo references.

Third Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's third ground of rejection in which the Examiner rejected claims 21 and 22 under 35 U.S.C. § 103(a) as unpatentable over the White reference in view of the Nevo and Gernhardt et al. references.

7. **ARGUMENT**

As discussed in detail below, the Examiner has improperly rejected the pending claims. Further, the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under § 103. More particularly, and as discussed in greater detail below, Appellants respectfully submit that the Examiner has failed to appreciate the distinction between "current leaking *into* [a] control circuit," as generally recited in the present claims (i.e., the "*input* leakage current" described and claimed in the present application), and "leakage current leaking *out of* a system to ground," as generally taught by both the White and Nevo references. Appellants first pointed out this distinction with respect to a rejection based on the Nevo reference, and the Examiner subsequently withdrew the rejection. *See* Response to Office Action filed July 5, 2005, pages 11-12 (noting the deficiency of the Nevo reference); Office Action mailed October 5, 2006, page 2 (in which the Examiner withdrew the rejection based on the Nevo reference). However, the Examiner has now instituted a new rejection based on the White reference, which suffers *precisely* the same deficiency – it is directed to measuring the amount of current leaking *out of the system* to ground and responding to such ground faults. *See* White, col. 3, lines 21-39 (which states, "*the stray current which flows to ground*, such as through an insulator or the like, for example, *is generally referred to in the art and herein as the 'leakage current*[ ]'" (emphasis added)).

The White reference is directed to a control apparatus 10 configured to detect excessive *current leaking out of the electrical system 12 to ground* (such as through deterioration of insulation in various components of the system 12, including load 14, power source 16, or conductors 18) and to prevent damage to the components of the system 12 by providing control signals that warn an operator or disable the system by *purposely* triggering a relay 110 when the leakage current flowing out of the system to ground exceeds certain levels. *See, e.g., id.*; col. 3, lines 56-66; FIG. In sharp contrast, the present application addresses current that *leaks into a control circuit* that may *inadvertently* trigger a relay and disable an electrical system. *See, e.g.,* page 6, line 24 – page 7, line 6. Accordingly, the present claims generally recite "*input* leakage current"

and "current *leaking into* the control circuit," as opposed to current leaking out of an electrical system to ground as in the White reference. Because the White reference fails to teach, disclose, address, or even acknowledge current that leaks *into* a control circuit, and is directed to an entirely different problem of current leaking out of a circuit to ground, the White reference fails to teach the elements of the claim alleged by the Examiner. Accordingly, for at least these reasons, Appellants respectfully request full and favorable consideration by the Board, as Appellants strongly believe that claims 1-38 are currently in condition for allowance.

A. **Ground of Rejection No. 1:**

The Examiner improperly rejected claims 1-28 and 34-38 under 35 U.S.C. § 103(a) as unpatentable over the White reference in view of the Nevo reference. Because this rejection is based on a clear miscomprehension of the prior art and the present claims by the Examiner, Appellants respectfully traverse this rejection.

Legal Precedent

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985).

Deficiencies of the Rejection of Claims 1-28 and 34-38

Turning now to the present claims, the White and Nevo references fail to disclose each element of claims 1-28 and 34-38. For instance, independent claims 1 and 11 each

recite "a leakage current suppression circuit configured to ... conduct leakage current leaking *into* the control circuit" (emphasis added). Similarly, independent claim 19 recites "a leakage current suppression circuit ... operative to conduct leakage current leaking *into* the control circuit" (emphasis added). Notably, claims 1, 11, and 19 also variously recite controlling a switch in view of a comparison of a control signal to an *input leakage current threshold.* Additionally, independent claim 34 recites "controlling a conductive state of a solid state switch in series with a relay coil such that the relay coil is energized if a current level of an input control signal is above a predetermined *input leakage current threshold level*" (emphasis added). Because the cited references fail to disclose such elements, the cited references cannot support a *prima facie* case of obviousness with respect to independent claims 1, 11, 19, and 34.

In the Office Action, the Examiner relied on the White reference as disclosing the recitations of claims 1, 11, 19, and 34 noted above. *See* Office Action mailed March 22, 2006, pages 3-4. This reliance, however, is grossly misplaced. As would be appreciated by one skilled in the art, the White reference discloses a control apparatus 10 for protecting an electrical system 12. White, col. 3, lines 56-66. Particularly, the cited reference teaches that control apparatus 10 reduces damage to components of system 12 by measuring excessive current leaking from the system 12 to ground. *Id.*; *see id.* at col. 3, lines 32-39. Notably, while the White reference also uses the term "leakage current," the White reference *explicitly states* that this term is used in the reference to denote "the stray current which flows [from the circuit] *to ground*" or, in other words, the current leaking *out* of system 12 to ground. *Id.* at col. 3, lines 32-39. The control apparatus 12 includes signal generating assemblies 32 and 34 that sense current leaking *out of the system to ground* and provide a warning signal and disconnect signal, respectively, based on the sensed *output* leakage current. *Id.* at col. 4, lines 44-60; *see id.* at col. 3, line 66 – col. 4, line 14.

Conversely, the present application discloses a circuit for suppressing unintentional current that may leak *into* a system or control circuit. *See, e.g.,*

Application, page 6, line 24 – page 7, line 6. Accordingly, in the present disclosure, the term "input leakage current" refers to this *unintentional current* entering the control circuit. Appellants also note that the background portion of the present disclosure clearly supports this meaning, reciting a particular need for circuitry that "can suppress leakage current *in*, rather than *from*, relay circuits." *Id.* at page 2, lines 3-5. Particularly, the present techniques employ a leakage current suppression circuit to prevent this unintentional current entering, or leaking into, the control circuit from energizing the relay operator or coil, "permitting current through the coil, only if the applied control signals exceed a leakage current threshold." *Id.* at page 2, lines 24-27; *see id.* at page 5, lines 12-14; page 7, lines 1-6; page 8, lines 1-9; page 9, lines 1-12.

In view of the discussion provided immediately above, it is evident that the White reference contains the same deficiencies earlier recognized by the Examiner with respect to the Nevo reference. It is also readily apparent that each of the White and Nevo references, at best, discloses the detection and discontinuation of an *output* leakage current from the apparatus (i.e., responding to current leaking *out of* the system to ground). However, neither of the cited references even mentions any current leaking *into* the disclosed systems and, thus, each of these references similarly fails to disclose any structure reasonably comparable to "a leakage current suppression circuit configured to ... conduct leakage current leaking *into* the control circuit" or controlling the switch in response to a comparison of a control signal and an *input* leakage current threshold as variously recited by the instant claims.

Because the White reference is deficient in precisely the same manner as the Nevo reference, these cited references collectively fail to disclose each and every element of the present claims. Consequently, the White and Nevo references cannot support a *prima facie* case of obviousness with respect to independent claims 1, 11, 19, or 34, or the claims depending therefrom.

In light of the foregoing remarks, Appellants respectfully request that the Board withdraw the improper obviousness rejection of claims 1-28 and 34-38. Additionally, Appellants respectfully request that the Board direct the Examiner to allow the instant claims.

B. **Ground of Rejection No. 2:**

The Examiner improperly rejected claims 29-33 under 35 U.S.C. § 103(a) as unpatentable over the Gernhardt et al. reference in view of the White and Nevo references. Appellants respectfully traverse this rejection.

Deficiencies of the Rejection of Claims 29-33

Appellants respectfully note that the White, Nevo, and Gernhardt et al. references fail to disclose each element of independent claim 29. For instance, independent claim 29 recites "a leakage current suppression circuit ... operative to conduct leakage current *leaking into* the terminal block relay assembly" (emphasis added). Additionally, claim 29 recites that the leakage current suppression circuit operates "to place the switch in a conducting state and thereby to energize the relay operator *when a control signal current level is above an input leakage current threshold*, and to place the switch in a non-conducting state and thereby to deenergize the relay operator *when the control signal level is below the input leakage current threshold*" (emphasis added). Because the cited references fail to disclose such elements, the cited references cannot support a *prima facie* case of obviousness with respect to independent claim 29.

As discussed above with respect to claims 1, 11, 19, and 34, the White and Nevo references collectively fail to disclose a leakage current suppression circuit that conducts leakage current leaking *into* any system, such as a terminal block relay assembly. The White and Nevo references similarly fail to disclose comparison of a control signal level to an input leakage current threshold, as also discussed above. Still further, the Gernhardt et al. reference fails to obviate the deficiencies of the White and Nevo references. Consequently, the White, Nevo, and Gernhardt et al. references, even considered in

hypothetical combination, fail to disclose each and every element of independent claim 29. Accordingly, Appellants respectfully submit that independent claim 29, as well as its dependent claims 30-33, is allowable over the cited references.

For at least these reasons, Appellants respectfully request that the Board withdraw the improper obviousness rejection of claims 29-33. Further, Appellants respectfully request that the Board direct the Examiner to allow claims 29-33.

C. **Ground of Rejection No. 3:**

The Examiner improperly rejected claims 21 and 22 under 35 U.S.C. § 103(a) as unpatentable over the White reference in view of the Nevo and Gernhardt et al. references. Appellants respectfully traverse this rejection.

Deficiencies of the Rejection of Claims 21 and 22

Appellants note that claims 21 and 22 depend from independent claim 19. As discussed above, the White and Nevo references collectively fail to disclose each element of independent claim 19. Further, Appellants respectfully submit that the Gernhardt et al. reference does not obviate the deficiencies of the White and Nevo references, including those deficiencies outlined above with respect to the independent claims. As a result, Appellants respectfully assert that dependent claims 21 and 22 are allowable at least on the basis of their dependency from a respective allowable independent claim, in addition to the subject matter separately recited in these dependent claims.

In light of the forgoing remarks, Appellants respectfully request that the Board withdraw the obviousness rejection of claims 21 and 22. Additionally, Appellants respectfully request that the Board direct the Examiner to allow the instant claims.

Conclusion

In view of the above remarks, Appellants respectfully submit that the Examiner has provided no supportable position or evidence establishing a *prima facie* case of obviousness with respect to claims 1-38. Consequently, Appellants respectfully submit that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: September 21, 2006

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8. CLAIMS APPENDIX

Listing of Claims:

1. A control circuit for an electrical relay, the circuit comprising:

a solid state switch configured to be coupled to a relay operator to control energization of the relay operator; and

a leakage current suppression circuit configured to be coupled electrically in parallel with the solid state switch to conduct leakage current leaking into the control circuit and to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an input leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the control signal level is below the input leakage current threshold.

2. The circuit of claim 1, wherein the solid state switch and the leakage current suppression circuit are coupled to a DC bus, and the solid state switch is configured to be coupled in series with the relay operator.

3. The circuit of claim 1, further comprising a signal conditioning circuit for conditioning the control signal.

4. The circuit of claim 1, further comprising a rectifier circuit for converting alternating current control signals to direct current control signals.

5. The circuit of claim 4, further comprising a signal conditioning circuit for smoothing the direct current control signals.

6. The circuit of claim 4, further comprising a signal conditioning circuit for limiting the voltage of the direct current control signals to a desired level.

7. The circuit of claim 1, further comprising a visual indicator of the operative state of the circuit.

8. The circuit of claim 7, wherein the visual indicator is a light emitting diode coupled to be energized upon application of the control signal.

9. The circuit of claim 1, wherein the leakage current suppression circuit includes a pair of resistors in series about a node, and wherein the leakage current suppression circuit is operative to place the solid state switch in a conducting state when a voltage at the node is above a desired level.

10. The circuit of claim 9, wherein the node is coupled to a base of the solid-state switch.

11. A control circuit for an electrical relay, the circuit comprising:

a rectifier circuit for receiving AC or DC control signals and for outputting DC control signals;

a DC bus coupled to the rectifier circuit for receiving the DC control signals;

a control signal conditioning circuit coupled to the DC bus for conditioning the DC control signals;

a solid state switch configured to be coupled across the DC bus in series with a relay operator to control energization of the relay operator; and

a leakage current suppression circuit configured to be coupled across the DC bus electrically in parallel with the solid state switch to conduct leakage current leaking into the control circuit and to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an input leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the control signal level is below the input leakage current threshold.

12. The circuit of claim 11, further comprising an input signal conditioning circuit electrically upstream of the rectifier circuit.

13. The circuit of claim 11, wherein the control signal conditioning circuit includes a capacitor for smoothing the DC control signals.

14. The circuit of claim 11, wherein the control signal conditioning circuit includes a diode for limiting the voltage of the DC control signals to a desired level.

15. The circuit of claim 11, further comprising a visual indicator of the operative state of the circuit.

16. The circuit of claim 15, wherein the visual indicator is a light emitting diode coupled to be energized upon application of the control signal.

17. The circuit of claim 11, wherein the leakage current suppression circuit includes a pair of resistors in series about a node, and wherein the leakage current suppression circuit is operative to place the solid state switch in a conducting state when a voltage at the node is above a desired level.

18. The circuit of claim 17, wherein the node is coupled to a base of the solid-state switch.

19. A relay control circuit comprising:

a relay having an operator and at least two output lines;

a solid state switch coupled in series with the relay operator to control energization of the relay operator; and

a leakage current suppression circuit coupled electrically in parallel with the solid state switch, the leakage current suppression circuit being operative to conduct leakage current leaking into the control circuit and to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an input leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the control signal level is below the input leakage current threshold.

20. The circuit of claim 19, wherein the relay is an electromechanical relay and the operator is a coil.

21. The circuit of claim 19, wherein the relay is supported on a terminal block, and wherein the solid state switch and the leakage current suppression circuit are supported on a circuit board mounted within the terminal block.

22. The circuit of claim 21, wherein the terminal block includes connections for routing the output lines to terminal points.

23. The circuit of claim 19, further comprising a rectifier circuit for converting alternating current control signals to direct current control signals.

24. The circuit of claim 23, further comprising a signal conditioning circuit for smoothing the direct current control signals.

25. The circuit of claim 23, further comprising a signal conditioning circuit for limiting the voltage of the direct current control signals to a desired level.

26. The circuit of claim 19, further comprising a visual indicator of the operative state of the circuit.

27. The circuit of claim 19, wherein the leakage current suppression circuit includes a pair of resistors in series about a node, and wherein the leakage current suppression circuit is operative to place the solid state switch in a conducting state when a voltage at the node is above a desired level.

28. The circuit of claim 27, wherein the node is coupled to a base of the solid-state switch.

29. A terminal block relay assembly comprising:

a terminal block including input terminals, output terminals, a bay for receiving a relay, and connections for routing signals between the terminals and the relay;

a relay disposed in the bay and coupled to the connections, the relay having an operator;

a circuit board supported in the terminal block and coupled to the input terminals and to the relay operator via two of the connections;

a solid state switch supported on the circuit board and coupled in series with the relay operator to control energization of the relay operator; and

a leakage current suppression circuit supported on the circuit board and coupled electrically in parallel with the solid state switch, the leakage current suppression circuit being operative to conduct leakage current leaking into the terminal block relay assembly and to place the switch in a conducting state and thereby to energize the relay operator when a control signal current level is above an input leakage current threshold, and to place the switch in a non-conducting state and thereby to deenergize the relay operator when the control signal level is below the input leakage current threshold.

30. The circuit of claim 29, wherein the relay is an electromechanical relay and the operator is a coil.

31. The circuit of claim 29, further comprising a light emitting diode coupled to be energized upon application of the control signal, the light emitting diode producing a visual indication of the operative state of the control signal visible from a side of the terminal block.

32. The circuit of claim 29, wherein the leakage current suppression circuit includes a pair of resistors in series about a node, and wherein the leakage current suppression circuit is operative to place the solid state switch in a conducting state when a voltage at the node is above a desired level.

33. The circuit of claim 32, wherein the node is coupled to a base of the solid-state switch.

34. A method for controlling a relay circuit, the method comprising:

controlling a conductive state of a solid state switch in series with a relay coil such that the relay coil is energized if a current level of an input control signal is above a predetermined input leakage current threshold level and is deenergized if the current level of the input control signal is below the predetermined input leakage current threshold level.

35. The method of claim 34, wherein the solid state switch is disposed electrically in parallel with a leakage current suppression circuit having a pair of resistors and a node, and wherein the conductive state of the solid state switch is controlled based upon voltage at the node to regulate energization of the coil.

36. The method of claim 35, wherein the voltage at the node is applied to a base of the solid state switch, and wherein current applied to the base of the solid state switch is limited.

37. The method of claim 34, further comprising conditioning the input control signal to convert an AC input control signal to a DC input control signal and to smooth the DC input control signal.

38. The method of claim 34, further comprising providing a visual indication of an operative state of the input control.

9. **EVIDENCE APPENDIX**

N/A

10. RELATED PROCEEDINGS APPENDIX

N/A